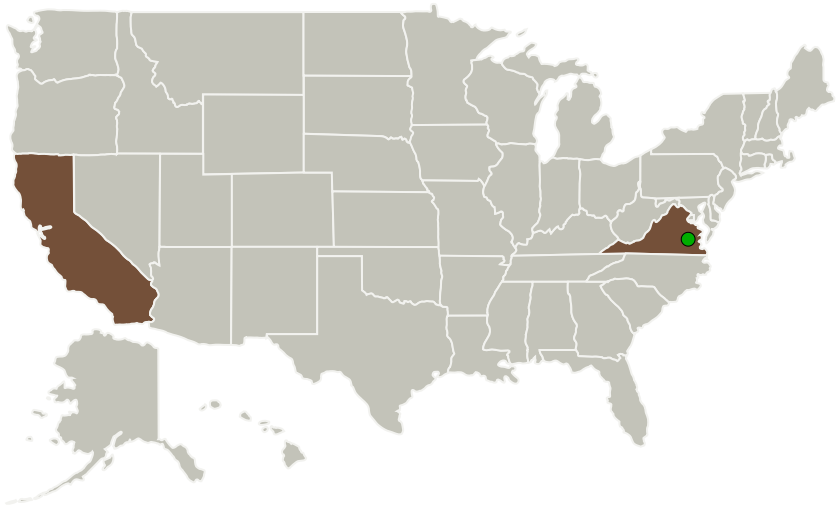
Charge Dissipating Transparent Conformal Coatings for Spacecraft Electronics, Phase I

Completed Technology Project (2011 - 2012)

Project Introduction

The space environment poses significant challenges to spacecraft electronics in the form of electrostatic discharge (ESD) as a result of exposure to highly charged radiation belts. The NASA Europa Jupiter System Mission environment, for example, exhibits radiation levels seven times greater than Earth's geostationary orbit. In addition to the Jovian environment, highly charged environments can also exist at geosynchronous and medium Earth orbits owing to solar winds/storms and trapped radiation belts. Such environments can wreak ESD havoc on unprotected critical spacecraft components inside the spacecraft bus. While existing conformal coatings serve their purpose of insulating and protecting electronics from environmental effects, they do not exhibit ESD mitigation qualities. No solution currently exists to provide both electronic environmental protection, optical transparency for component inspection, and charge dissipation characteristics in one coating system. To address this need, Luna, in partnership with The Aerospace Corporation, proposes to modify industry standard and space-qualified conformal coatings by dispersing transparent and conductive nanoparticles within them to impart electrical conductivity levels sufficient for charge dissipation and increased radiation hardening capability. The proposed coating system will provide the appropriate performance properties of both common conformal coating protection and radiation hardening through ESD mitigation.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Luna Innovations, Inc.	Lead Organization	Industry	Roanoke, Virginia
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia
The Aerospace Corporation	Supporting Organization	Industry	El Segundo, California

Primary U.S. Work Locations	
California	Virginia

Project Transitions

February 2011: Project Start

February 2012: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138033)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Luna Innovations, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

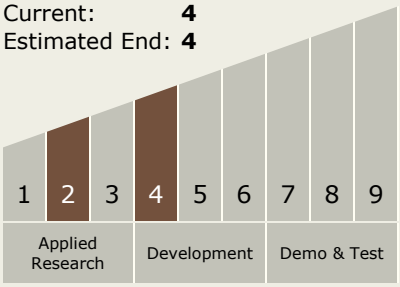
Carlos Torrez

Principal Investigator:

Adam Goff

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.1 Materials
    - TX12.1.5 Coatings

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System